Glossary

**Adaptation** An investment to reduce the severity of realized damages.

**Adverse selection** A problem related to the hidden type of a person or firm such that a buyer cannot distinguish the quality of a good or service.

**Ambiguity** Uncertainty about the probabilities of an outcome.

**Ancillary benefit** An additional benefit that arises from reducing fossil fuel consumption; for example, lower levels of carbon monoxide, sulphur and nitrogen oxides, and toxic trace pollutants in exhaust gases.

**Autarky** Where a country does not engage in international trade.

**Behavioural economics** The application of psychological insights into economic theory and observation.

**Benefits transfer** The practice of extrapolating existing information on the non-market value of goods or services.

**Bid curve** The use of regression analysis to determine the relationship between willingness-to-pay (WTP) measures and the factors that are thought to influence these measures.

**Bid vehicle** The means by which individuals pay in a hypothetical market.

**Biodiversity hotpots** Regions identified by Conservation International as combining high levels of biodiversity with high levels of threat to habitat.

**Bioprospecting** Analysing compounds derived from flora and fauna for compounds that could form the basis for new drugs.

**Carbon footprint** A measure that accounts for all carbon emissions generated by a nation’s citizens, regardless of where the good was produced.

**Carbon sink** A process that destroys or absorbs greenhouse gases, such as the absorption of atmospheric carbon dioxide by trees, soils, and other types of vegetation.

**Carbon tax** A fee added to the price of fossil fuels according to their relative carbon content.

**Characteristics** Theory of Value The theory that the value of something is best explained in terms of its characteristics or attributes.

**Clean development mechanism** A system in which developed nations buy the carbon reductions in developing nations.

**Climate change** A change in the climate (global temperatures and precipitation) over time due to changes in natural process or external forcings.

**Coase theorem** If transaction costs are low, two disputing parties can bargain to a solution provided that a third party assigns property rights to one of the parties.

**Common property** A good defined by rival consumption and open or controlled access to a resource.

**Comparative advantage** A measure of the difference in the opportunity cost of producing a good between two countries. The existence of a comparative advantage is a prerequisite for there being a gain from trade.

**Co-operative game theory** This concerns the returns to forming coalitions and sharing the pay-offs.

**Core** In co-operative game theory: the set of pay-offs that can be agreed that will keep a coalition of players together.They must receive at least as much as part of the coalition as they do either alone or in another coalition.

**Cost–benefit analysis** A decision-making rule used to evaluate a number of different policy options or projects in order to determine which contributes the most to net social well-being or, equivalently, which is the most efficient in terms of its use of resources.

**Critical natural capital** That part of natural capital that is either essential for human survival and/or cannot be substituted for by other forms of capital.

**Deforestation Kuznets curve** The hypothesis that the rate of deforestation will decline when a country reaches higher levels of income.

**Dominant strategy** A strategy that a player can choose that is best regardless of what the other players in the game choose.

**Dose–response model** A measure of the economic value of the environment as an input to production by considering the impacts of pollution on market-valued outputs.

**Economic efficiency** Getting the most net benefits one can with the available resources.

**Economic growth** The change in gross national product (GNP) over a given time period—say, a year.

**Economic rent** The difference between resource price and the marginal cost of extraction (also called ‘user rent’ or ‘resource rent’).

**Ecosystem services** The valuable resources and services provided by natural ecosystems; for example, carbon sequestration, nutrient cycling, and climate regulation. Ecosystem services provide inputs into the production of some goods and services, and may also be a direct source of utility.

**Environmental ‘bads’** Those environmental inputs for which the individual prefers less to more.

**Environmental ‘goods’** Those environmental inputs for which the individual prefers more to less.

**Environmental Kuznets curve (EKC)** The idea that the relationship between income and environmental quality is an inverted U-shape; as income per capita increases, environmental impact also increases initially, until it reaches a maximum and then begins to decline.

**Existence or non-use value** The utility people derive from just knowing that a particular natural asset exists.

**Expected utility** The combination of probabilities and the utility associated with outcomes of good and bad events.

**Experimental auction** A method that values risk reduction using a bidding auction.

**Externalities** When one party imposes costs or benefits on another party without paying or receiving compensation.

**Fat-tail distribution** A fat tail reflects the idea that the probability of an extreme-impact event is not as rare as believed under the ‘business as usual’ climate scenarios.

**Faustmann formula** This formula gives the optimal rotation for a forest that is replanted and clear-felled at regular rotation lengths.

**Flow pollution** The annual rate of carbon emission.

**Framing effect** When people are affected by how information is presented.

**Free-rider** A country that does not contribute to climate policy, but that still captures all the benefits of climate protection and pays none of the costs.

**Frontier model** A theory of deforestation that is driven by opening up new regions to logging through investment: this contrasts with the immizerization model.

**Gains from trade** The hypothesis that trade raises income: it allows countries to attain more goods and services, and increases demand for environmental goods and services.

**Genuine savings (GS)** An indicator of sustainable development that measures the value of the net change in all forms of capital—produced, natural, human, and social—in an economy over a given period of time; a negative genuine savings value indicates that development is unsustainable.

**Geochemically scarce mineral** A metal held in ores (typically silicates) that requires a relatively high level of energy to extract. Such ores can be too costly to extract.

**Green net national product (green NNP)** A sustainable development indicator that involves correcting the national accounts to allow for environmental inputs to the economy that are unpriced by the market; for example, depreciation of natural capital and the value of changes in environmental quality that impact directly on people’s utility; rising green net national product over time indicates that development is sustainable.

**Gross national product (GNP)** The monetary value of the aggregate output, expenditure, or incomes of a country in a given time period. Gross domestic product (GDP) is another way of measuring this aggregate output, income, or expenditure.

**Hartwick rule** The idea that an economy can maintain constant consumption levels over time if all rents from non-renewable resource depletion are reinvested in produced capital.

**Hidden information** When one person knows more about his or her actions (e.g. protection level) or type (e.g. low-cost) than the environmental regulator.

**Hotelling’s rule** An economic theory proposed by Hotelling (1931), which predicts that, in equilibrium, the marginal profit of a non-renewable resource firm increases at the interest rate through time. Simpler versions of the model predict that the price (when costs are zero) of the non-renewable resource will increase at the interest rate.

**Human development indicator** A measure developed by the United Nations that uses three indicators—GDP, education levels, and life expectancy—to represent the development of a given country.

**Hypothetical market bias** The tendency for respondents in a stated-preference survey to overstate or understate their actual willingness to pay (WTP) for a change in environmental quality.

**Immizerization model** A theory of deforestation that is driven by incremental expansion of shifting agriculture driven by population growth and impoverished families striving to increase their incomes through expanding agricultural production: this contrasts with the frontier model.

**Indirect benefits** Environmental benefits that are measured indirectly via their role in the production process; for example, the role that wetlands play in the production of fish caught by commercial fishing.

**Insurance** An investment that transfers wealth from good to bad states of nature given that a bad event has been realized.

**Kyoto Protocol** The international environmental agreement that binds the participating countries to carbon emissions reductions below 1990 levels by 2008–12.

**Loss aversion** A concept from behavioural psychology claiming that people value losses more highly than equivalent gains, because they value that which they already have more than that which they could acquire.

**Marginal abatement cost (MAC)** The cost of decreasing emissions by an additional unit.

**Market** An exchange institution to create economic value through trade.

**Market failure** When the allocation of scarce resources achieved through markets is socially inefficient.

**Maximum sustainable yield** In relation to fisheries economics, this is the maximum catch that a fishery can sustain without depleting the stock.

**Measure of resource scarcity** The value of a unit of resource in the ground is measured as the difference between the resource price and the marginal cost of extraction. If the measure of scarcity is increasing, the resource is becoming scarcer in economic terms. Economic scarcity is distinct from geological scarcity.

**Mitigation** An investment to reduce the probability of damages due to carbon emissions

**Moral hazard** The hidden actions of a person or firm that allow them to capture benefits or reduce costs to the detriment of others.

**Nash equilibrium** In a gaming situation, a set of strategies, one for each player, where no player can improve his or her pay-off by switching to another strategy. In other words, this occurs when each player is playing the best response to all the other players’ strategies.

**Natural forest** This is difficult to define, because most forests have been modified to some extent. It can be taken to refer to a forest largely made up of the endemic native species found in a region. In many cases, these forests have been modified by human intervention.

**Net present value** The sum of discounted benefits associated with a particular project minus the sum of discounted costs.

**Non-point pollution** Emissions that enter water-bodies in a diffuse manner, such as through run-off from agriculture or forestry.

**Non-renewable resource** Any resource—for instance oil, gold and iron ore—that has a fixed stock. This contrasts with a renewable resource (such as a fishery) that grows through time by reproduction and growth.

**Non-timber forest products (NTFP)** This includes products taken from forest areas, such as bushmeat, nuts, berries, and rubber, that depend upon a standing forest.

**Non-uniformly mixed pollutants** Pollutants whose impact on water quality varies spatially.

**Opportunity approach to sustainable development** This requires that future generations have at least as much capital as the current generation, so that they have the opportunity to achieve the same levels of well-being as the current generation.

**Opportunity cost** The best alternative use forgone.

**Option price** The willingness to pay (WTP) to reduce the probability of a bad outcome.

**Outcome approach to sustainable development** This requires that utility or consumption do not decline over time.

**Pigovian/green tax** A price set equal to the marginal damages caused by pollution.

**Plantation forest** Typically, a monoculture of trees planted either for timber or for other forms of production. It is distinct from a natural forest, as it is often comprised of a non-native species, whereas natural forests are communities of species that are native or endemic to a region.

**Point source pollution** Emissions that enter water-bodies from a single identifiable source, such as a pipe.

**Point–non-point trading** ­An emissions trading system in which point sources of pollution and non-point sources of pollution trade emissions permits with each other.

**Pollution havens hypothesis** This predicts that pollution-intensive industries will relocate to developing countries as environmental regulation in developed countries is made more stringent.

**Porter hypothesis** A claim that environmental regulation stimulates innovation and productivity.

**Preference heterogeneity** The idea that people’s preferences vary and thus that individuals place different values on a given good.

**Preference reversal** When a person is inconsistent in his or her preference rankings and the monetary evaluation of lotteries; for example, you rank lottery A higher than lottery B, but you put a higher dollar value on B than on A.

**Production-function approaches** Valuing non-market changes in environmental quality by estimating the implications of such changes for the output and price of a market-valued good or service.

**Production possibility frontier (PPF)** This gives the combinations of goods that it is possible to produce in an economy given the resources (land, labour, and capital) of that country. For instance, if there are only two goods produced—food and cloth—then the PPF tells us how much food can be produced if an amount of cloth is produced. The slope of the PPF gives us the opportunity cost of producing one more unit of a good.

**Property rights** The ownership of resources, and the obligations and responsibilities that go along with ownership.

**Public goods** Goods defined by non-rival consumption and non-excludability to access the resource.

**Race-to-the-bottom hypothesis** The idea that countries open to trade adopt looser environmental standards as a means of maintaining international competitiveness.

**Rational choice** When people make consistent choices that maximize their well-being given budget constraints.

**Repeated game** A situation in which a one-shot game is repeated.This may lead to a different solution to the one-shot game, especially as players gather information about the strategies of the other players.

**Revealed-preference method** Determining the value that individuals place on non-market environmental goods by studying their behaviour in markets for related goods; such methods include hedonic pricing and travel-cost models.

**Risk** The combination of probabilities and consequences of good and bad states of nature.

**Risk assessment** The quantitative estimation of risks to human and environmental health.

**Risk perception** A belief that people hold about risk and risky events.

Safe minimum standard (SMS) This identifies the minimum viable level for a natural resource, and only allows this safe minimum standard to be breached if the social opportunity cost of maintaining the standard is too high.

**Safe operating space** A series of threshold levels for important ecosystem processes that should not be crossed.

**Self-insurance/adaptation** An investment to change the severity of the realized outcomes of events.

**Self-protection/mitigation** An investment to change the probability of events.

**Shadow project** This requires any action that reduces the stock of natural capital to be offset by a physical project that replaces the natural capital loss.

**Species–area curve** A relationship between the area of land considered and the number of unique species found.As more land is considered in a region, then the number of extra species found tends to decline.

**Stated-preference methods** Direct questioning of people using surveys in order to determine their willingness to pay (WTP) or willingness to accept compensation (WTA) for a hypothetical change in environmental quality; such methods include contingent valuation and choice experiments.

**Stern Review** A report commissioned by the UK government to study the economics of climate change. The main conclusion was that the benefits (i.e. avoided damages) of extreme and immediate climate protection outweigh the costs.

**Stock pollution** The total level of accumulated carbon in the atmosphere.

**Strong sustainability** This requires a non-declining stock of natural capital and so assumes that natural capital cannot be directly substituted for by human, social, or produced capital.

**Sustainable development** Economic development that allows the current generation to meet its needs without compromising the ability of future generations also to its own needs.

**Total economic value** The sum of direct benefits   
(use + existence values) and indirect benefits.

**Tradable pollution permit** A market created to buy and sell the rights to emit a unit of pollution into the environment (also called marketable permits or cap-and-trade).

**Trade liberalization** A process by which a group of countries reduce or eliminate import quotas and tariffs.

**Tragedy of the commons** In the extreme version, due to Garrett Hardin, a situation in which the overuse of a common-property resource leads to resource degradation and environmental collapse. The term is also used to describe a situation in which there is an incentive for an individual firm to overexploit a resource (e.g. a fishery), leading to a Nash equilibrium in which all firms overexploit the resource.

**Uniformly mixed pollutants** Pollutants that have the same impact on water quality regardless of where they originate.

Use value The utility that people derive from directly making use of a natural asset.

**Value of statistical life** The monetary value of reducing the risks of death.

**Weak sustainability** This requires a non-declining total capital stock and so assumes that all forms of capital (natural, human, social, and produced) are substitutes for each other.

**Willingness to accept compensation (WTA)** The minimum monetary compensation that an individual would be willing to accept to forgo something good, such as an improvement in environmental quality, or to put up with something bad, such as a decrease in environmental quality.

**Willingness to pay (WTP)** The maximum income that an individual would be willing to give up to gain something good, such as an improvement in environmental quality, or to avoid something bad, such as a decrease in environmental quality.